

## Roark's Formulas for Excel – Superposition Wizard

Universal Technical Systems (UTS) is proud to announce the introduction of Roark's Formulas for Excel. The Seventh Edition of *Roark's Formulas for Stress and Strain* is completely interactive and made available within Excel. This popular handbook has been in existence for over sixty years and used by engineers the world over. UTS fully computerized the contents allowing you to undertake calculations and report on them. It includes interactive calculations for all cases and tables with accompanying diagrams that help streamline the design process and reduce design iterations while minimizing the need for complicated finite element analysis.

Some key features include:

- All Chapters, Tables, and Cases made available in Excel through a menu.
- Product available for use in Excel 2000 and greater.
- Simply load the model you want, enter input data and view the calculations including plots, deflections, stress, etc.
- UTS also included a Superposition Wizard to aid multiple load calculations on beams and plates: this document provides further details on this feature.

### UTS Offering

- 1) Roark's Formulas for Excel software.
  - a. Requires MS Excel 2000 or greater
  - b. User Manual available in PDF format
- 2) 7<sup>th</sup> Edition of *Roark's Formulas for Stress and Strain* by Warren Young and Richard Budynas.

### Order

Contact UTS at [www.uts.com](http://www.uts.com)

Further details are available online at [www.uts.com](http://www.uts.com) and [www.roarksformulas.com](http://www.roarksformulas.com)

**Contact UTS today if you want a free trial of the software – try before you buy!**

The following provides brief details on using the product. A PowerPoint presentation and Flash demonstration are available on request.

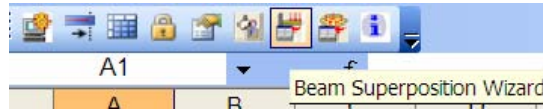
## Roark's Formulas for Excel's Superposition Wizard

### *The Superposition Wizard (SW)*

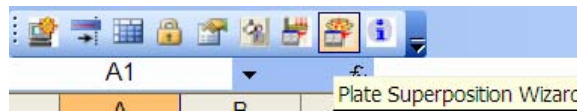
Creating a means of entering data quickly while easily handling multiple loads was the goal for this release of this product: as a result, a simple series of data entry windows facilitate this. We call this the Superposition Wizard in Roark's Formulas for Excel.

The Superposition Wizard (SW) is contained with the Roark's Formulas for Excel product and consists of two icons:

#### **Beam Superposition Wizard**

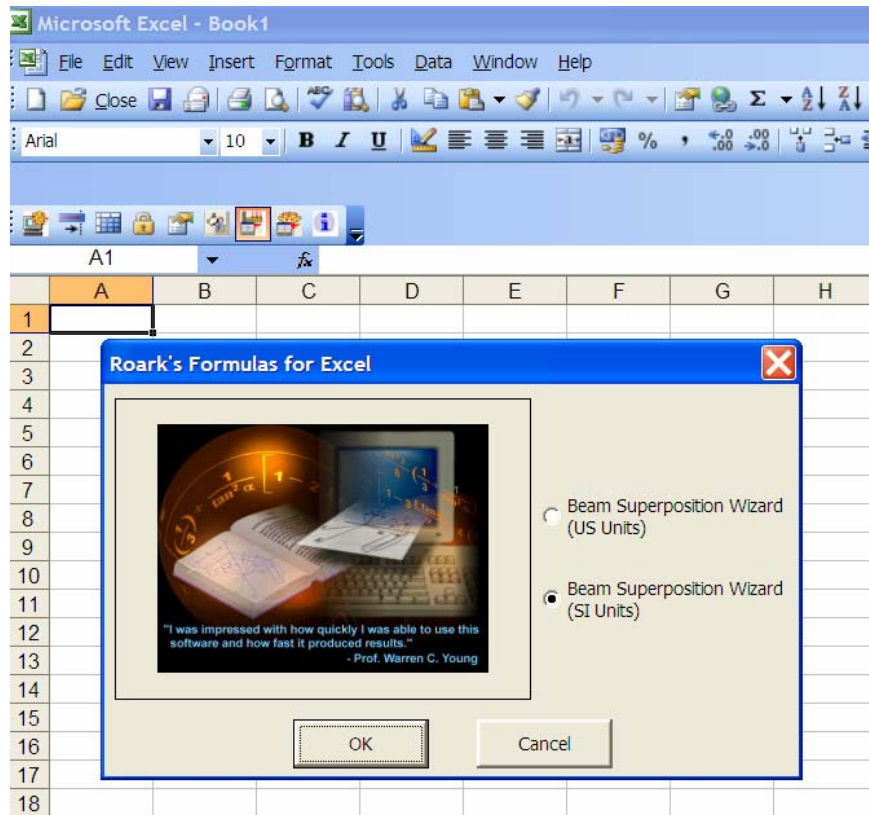


#### **Plate Superposition Wizard**

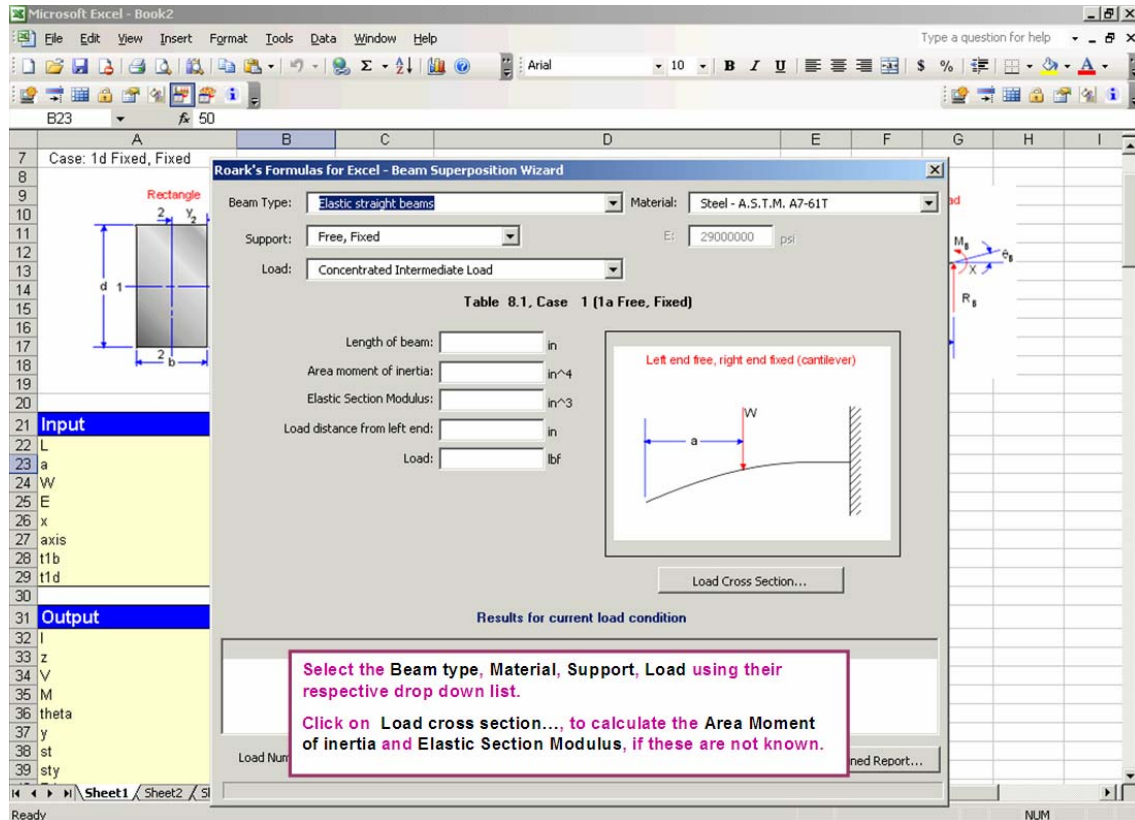


Each is similar in their approach and becomes active if any multiple load calculations on either a beam or plate are required: simply click the appropriate icon. Let us focus on the Beam Wizard to see how it operates:

#### **Step1 – Select a Working Unit**



**Step 2 – Data Entry**



**Beam Type.** Select from all the various cases that are available from the pull-down menu and note that the Table reference and description provided are references to the actual Seventh Edition of *Roark's Formulas for Stress and Strain*. Additionally, a diagram of the system appears with nomenclature.

**Support type and Load type.** The beam support type and load type are available in a pull-down menu. The options available are dependent on the Beam type selected and are viewable in the diagram of the system.

**Material.** Various materials exist within the material pull-down menu and include metals, woods, concretes and other material types. For each material type, the Young's modulus and the Gamma value (if appropriate), populates automatically upon material selection.

If the material type you need is not already available or specific Young's Modulus and or gamma values are required, then you can enter them as necessary.

At this point, the case is selected, specific dimensions can be entered, and data solved.

The entry data that appears is specific to the case selected and is mainly dimensionally related.

## Roark's Formulas for Excel's Superposition Wizard

### Enter dimensional data

All of the data that appears in the boxes next to the diagram is editable. Some data (Area moment of inertia and Elastic Section Modulus) are dependent on the shape of the cross section of the beam, and this can be determined after clicking on "Load Cross Section..." which opens a new window:

The screenshot shows a window titled "Cross Section Information" with a close button in the top right corner. Inside the window, there is a dropdown menu labeled "Cross Section:" with "Hollow Rectangle" selected. Below this are five input fields, each followed by "in":  
Neutral Axis (1,2): 1  
Side, b: 6  
Hollow Side bi: 5  
Side d: 6  
Hollow Side di: 5  
To the right of these fields is a diagram of a hollow rectangle. The diagram is labeled "Hollowrectangle" in red. It shows an outer rectangle with width  $b$  and height  $d$ , and an inner rectangle with width  $b_i$  and height  $d_i$ . The neutral axis is indicated by a horizontal line. The distance from the neutral axis to the top outer edge is  $y_2$ , and the distance to the bottom outer edge is  $y_1$ . The diagram also shows the thickness of the top and bottom flanges as  $t_1$  and  $t_2$ . At the bottom left of the window is a button labeled "Done, Return to Beam Inputs".

Select a "Cross Section" from a pull-down menu to show a diagram (below) with full nomenclature. Enter your data and, once complete, click the "Done, Return to Beam Inputs" button to allow the Area Moment of Inertia and the Elastic Section Modulus to be calculated.

Once all the data is in place, the condition for this beam type calculates by clicking on the "Solve for Load Condition" button. This calculates various data such as deflection, bending moment, shear angle etc.

## Roark's Formulas for Excel's Superposition Wizard

### Adding further loads

If further loads need adding to the beam, then this can be done within the SDEW.

In the lower left portion of the SDEW is a data entry field for the load number. When a second load is entered (enter 2), this “grays” out all fields that must remain constant for the second load.

Roark's Formulas for Excel - Beam Superposition Wizard

Beam Type: Elastic straight beams Material: Steel - A.S.T.M. A7-61T

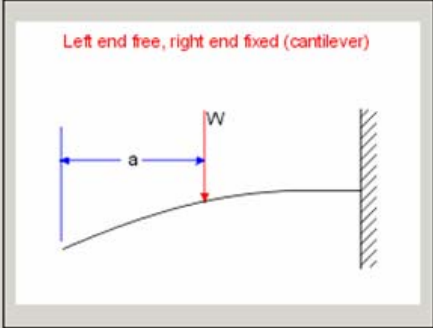
Support: Free, Fixed E: 29000000 psi

Load: Concentrated Intermediate Load

**Table 8.1, Case 1 (1a Free, Fixed)**

Length of beam: 100 in  
Area moment of inertia: 55.9167 in<sup>4</sup>  
Elastic Section Modulus: 18.6389 in<sup>3</sup>  
Load distance from left end: 40 in  
Load: 75 lbf

Left end free, right end fixed (cantilever)



Load Cross Section...

**Results for current load condition**

x	y	V	M	theta	sty
0	-0.00666	0	0	0.00008	0
1	-0.00658	0	0	0.00008	0
2	-0.00649	0	0	0.00008	0
3	-0.00641	0	0	0.00008	0
4	-0.00633	0	0	0.00008	0

Load Number: 2

After you enter the data for the second load, click the “Solve for Load Condition” button. This combines the result data for the two load conditions.

## Roark's Formulas for Excel's Superposition Wizard

### Step 3 – Reporting

To view the model report, click on “Show Combined Report...” (below is the single load case):

**Roark's Formulas for Excel - Beam Superposition Wizard**

Beam Type: Elastic straight beams Material: Steel - A.S.T.M. A7-61T

Support: Free, Fixed E: 29000000 psi

Load: Concentrated Intermediate Load

**Table 8.1, Case 1 (1a Free, Fixed)**

Length of beam:  in

Area moment of inertia:  in<sup>4</sup>

Elastic Section Modulus:  in<sup>3</sup>

Load distance from left end:  in

Load:  lbf

Left end free, right end fixed (cantilever)

**Results for current load condition**

x	y	V	M	theta	sty
0	-0.07236	0	0	0.00099	0
1	-0.07137	0	0	0.00099	0
2	-0.07038	0	0	0.00099	0
3	-0.0694	0	0	0.00099	0
4	-0.06841	0	0	0.00099	0

Load Number:

Creating Report...

A report includes the input data, calculated outputs and plots including Bending moment, Stress, Shear, Deflection, and Slope. This report can be saved in either PDF or RTF format.

**Interactive Roark's Formulas: Beam Superposition Report**

Beam Type: Elastic straight beams  
Support Condition: Free, Fixed  
Material: Steel - A.S.T.M. A7-61T

Left end free, right end fixed (cantilever)

---

**Input**

Description	Value	Unit
Length of beam (L)	100	in
Area moment of inertia (I)	55.916667	in <sup>4</sup>
Elastic Section Modulus (I/c)	18.638889	in <sup>3</sup>
Young's Modulus (E)	29000000	psi
Material (matnum)	Steel - A.S.T.M. A7-61T	
<b>Load 1:</b>		
Load distance from left end (a1)	20	in
Load (W)	500	lbf
Location (x)	0	in

## Contact Universal Technical Systems

Visit [www.uts.com](http://www.uts.com) anytime.  
You may also visit [www.roarksformulas.com](http://www.roarksformulas.com)  
for more information about Roark's Formulas for Excel.

### Technical Support

**Email (worldwide):** [support@uts.com](mailto:support@uts.com)  
**North America and worldwide:** +1 815 963 2220  
**Europe:** +44 (0) 1234 302 618  
**India:** +91 (20) 2769 1200

User Forums are also available at [www.uts.com](http://www.uts.com)

### Sales and Other Questions

#### Universal Technical Systems, Inc.

202 West State Street, Suite 700  
Rockford, IL 61101, USA

Toll Free Sales: 800-435-7887  
Worldwide: +1 815-963-2220  
Fax: +1 815-963-8884  
[sales@uts.com](mailto:sales@uts.com)

#### Universal Technical Systems (Europe), Ltd.

2 Richmond Road  
Bedford, MK40 3DG, United Kingdom

Telephone: +44 (0) 1234 302 618  
Fax: +44 (0) 1234 296 587  
[euro@uts.com](mailto:euro@uts.com)

#### Universal Technical Systems (India), Pvt. Ltd.

A1, Technology Park  
MIDC, Talwade, Pune 412 114, India

Telephone: +91 20 2769 1200  
Fax: +91 20 2769 1500  
[Sales\\_india@uts.com](mailto:Sales_india@uts.com)